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ABSTRACT

A decline exists in children's ability at ages 4 and 5 to accurately respond to the difference between polar adjectives such as "big" and "tall." "Taller" and "bigger" are both taken to mean "having a higher top point," rather than "bigger" meaning "greater overall mass." Two hypotheses are put forth to explain this. The "strong cognitive hypothesis" bases the negative change in children's understanding of "big" and "tall" on changes in the child's cognitive processing of the world. Confusion of referents occurs when certain perceptual categories of one adjective become more salient and are overgeneralized to other referents. The vertical spatial dimension of "tall" may be generalized to be the critical dimension of "big" as well. The alternative hypothesis, the "strong semantic hypothesis," is similar but states that overgeneralization is of semantic, rather than perceptual qualities, these qualities having been acquired at an earlier age. This could cause confusion between "tall," "high," and "big," with overextension of the features (+vertical) and (+positional). The latter hypothesis may be made more or less plausible by researching data on the acquisiton of spatial adjectives in other languages. (PJM)

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DECREMENTS IN CHILDREN'S RESPONSES TO BIG AND TALL: A Reconsideration of the Potential Cognitive and Semantic Causes*

Virginia C. Mueller Gathercole

Abstract : The potential causes of decrements in children's understanding of big and tall (Maratsos, 1973, 1974) are reconsidered. Five hypotheses are examined in detail. Two of them, the strong cognitive hypothesis and the strong semantic hypothesis, offer the most viable explanations for the decrements, but it is impossible to choose between them on the basis of the evidence presently available. However, it is argued that one type of evidence would prove instrumental in choosing between the two hypotheses: data on the acquisition of spatial adjectives in other languages. The implications that such evidence would have for the acquisition of word meaning in general are discussed.

Introduction

In recent years, a considerable amount of research on child language development has focused on the acquisition of relative polar opposites, such as big-little, tall-short, long-short, and high-low (E. Clark 1972, 1973, Donaldson and Wales 1970, H. Clark 1970, Bartlett 1976, Carey 1978b, Eilers, Oller and Ellington 1974, Brewer and Stone 1975, Ehri 1976, Townsend 1976, Klatzky, Clark, and Macken 1973, Nelson and Benedict 1973, Maratsos 1973, 1974, Lumsden and Poteat 1968). This set of adjectives has been of interest because it constitutes a well-defined set of semantically-related words that can provide a basis for testing theories of the acquisition of word meaning. The process by which the child learns the various semantic elements associated with this group of adjectives has played a major role in E. Clark's Semantic Feature Hypothesis (1973), in subsequent studies testing that hypothesis (Bartlett 1976, Eilers, Oller, and Ellington 1974, Brewer and Stone 1975, Ehri 1976, Klatzky, Clark, and Macken 1973), and, more recently, in Carey's (1978b) "Missing Features Plus Haphazard Examples" hypothesis.

Although much of the research to date has focused on the upward progression in a child's command of this set of adjectives and of the semantic features common to them, some important work has also been conducted that reveals decrements in children's understandings of at least two of these adjectives. In particular, Maratsos (1973, 1974) has reported a decline with age in children's ability to accurately respond to big and tall. Although 3-year-olds generally respond accurately to these adjectives in experimental settings, 4- and 5-year-olds show an increasing tendency to err in their responses. Children aged four and five

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have a much stronger predilection than 3-year-olds to respond to big as if it means "tall" (Maratsos 1973) and to big and tall as if they mean "high" (Maratsos 1974).

Although Maratsos (1973, 1974) suggests several complex factors that might be responsible for these apparent decrements in children's understandings of big and tall, the reasons for these changes remain unclear. Nevertheless, discovering why a child's understanding of big and tall change in the ways described by Maratsos may prove to be a critical key to understanding how the child learns the meanings of all spatial adjectives, and, ultimately, how the child learns word meanings in general. The purpose of this paper is to reexamine closely the potential causes of the decrements in children's understandings of big and tall and to explore means of determining which of those potential causes is actually operative in the acquisition of these adjectives. In the course of the discussion, I will clarify how these decrements might play a crucial role in illuminating the process of the acquisition of word meaning.

After first reviewing the evidence for the decrements in children's responses to big and tall, I will present five hypotheses that might explain those decrements. It is at times difficult to tease apart the potential causes of changes in children's responses to big and tall, but it is important to attempt to do so because each explanation ultimately leads to a different view of the acquisition of word meaning. The first three hypotheses are based on minor changes in the child's knowledge -- that is, based on improvements either in strategies that are not directly related to the meanings of big and tall, or in knowledge of big and tall that is at least seminally present in the 3-year-old's knowledge. The remaining two hypotheses are based on major changes in the child's knowledge -- that is, based on changes that represent major new insights, or a reorganization, in the child's knowledge of the world or his knowledge of the semantic structure of words. As each hypothesis is discussed, the extent to which it can or cannot explain the response patterns in Maratsos (1973, 1974) will be explored. Although each of the first three hypotheses will be shown to be unsatisfactory in some way, the last two hypotheses appear to be equally plausible explanations for the evidenced decrements in children's understandings of big and tall. The available evidence does not allow us to choose between these two hypotheses, but I will suggest one type of evidence that might prove instrumental in determining which of these possible causes is operative in the developmental changes in children's responses to big and tall. Finally, I will discuss how such evidence might bear on our understanding of the meanings of words for children. In particular, I will discuss how evidence in favor of a strong semantic explanation would lend substantial support to Carey's (1978b) "Missing Features Plus Haphazard Examples" hypothesis, and how evidence in favor of a strong cognitive explanation should lead us to seriously reflect on the criteria we use in describing the semantic representation of a word in the child's lexi-

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The Evidence

In a study of children's understanding of big, Maratsos (1973) found that when children were shown two objects and were asked "Which one is the big one?" 3-year-olds correctly responded by choosing the stimulus that had the greater overall mass; however, older children, especially from 4;6 on, responded by choosing the object that had the greater height, rather than the greater overall mass. Lumsden and Poteat (1968) obtained similar greater-height responses to bigger from children aged 5;5 to 6;6. The older child incorrectly responds to big as if it means "tall" even when the area of the shorter object is as much as four times that of the taller object (Lumsden and Poteat 1968). When two stimuli are of the same height, but of different widths, children aged 4;6 and older usually assert that the two objects are the same size or that they are both big (Maratsos 1973: 749).

There is a comparable change in children's developing understanding of tall, and to a lesser extent, of big, towards interpreting the adjective as if it means "high." Maratsos (1974) conducted seven experiments in which children were shown pairs of stimuli of unequal heights and sizes. The stimuli were presented under two conditions, a static condition and a movement condition. In the static condition, the two objects were placed either at the same base level or with one at a higher base level than the other. In the movement condition, one object that had first been placed at the same base level as another was raised or lowered. The child was asked "Which one is the big (tall, high) one?" (High was only tested in the static condition, however.) In their responses to big, the younger children generally performed well, and the older children performed well in the static condition. However, in the movement condition, the older children responded to big by choosing the higher object. When the questions contained the word tall, children aged 3;0 to 4;5 responded correctly in the static condition, but chose the higher object in the movement condition. Children aged 4;6 to 5;11 chose the higher object, regardless of its size, in both the static and movement conditions.

Maratsos interprets the results of this second study as indicating that the subjects showed an increasing tendency with age to interpret tall and big as referring to the object with a higher top point. However, the data are also consistent with an interpretation under which the child shows an increasing tendency with age to respond to tall and big as if they refer to a higher base point or a higher position in general. The critical contexts for revealing a change in response patterns from correct responses to "higher top point" responses were those in which the smaller, shorter object of a pair of stimuli was located on a higher level than the larger, taller object. In those critical cases, the object with the higher top point also always had the higher base point, or the higher position in general. Thus it is impos-

sible to determine whether the important cue for the child was higher top point, higher base point, or higher position in general. Nevertheless, with the understanding that the response patterns evidenced by the older children in the study could have been based on higher top point, base level, or position in general, we can refer to the type of response uncovered in this study as one in which the child responds to tall or big as if it means "high."[1]

Explaining the Changes in Response Patterns

The decrements found in children's abilities to respond accurately to big and tall might be due to changes in several different realms. In the following sections, I will consider five possibilities. I will argue that the first three possibilities do not appear to adequately account for all the data, but each of the two alternative possibilities is a plausible explanation for the evidenced decrements.

Three Initial Hypotheses The changes in children's responses to big and tall might, first, be due to comparatively minor changes in children's knowledge. The decrements might be due to changes in the non-linguistic strategies the child uses in experimental settings, or to linear improvements in the child's already existing knowledge of big, tall, and high. I will discuss three hypotheses that might be made with respect to these types of causes: the "non-linguistic strategy hypothesis," the "weak semantic hypothesis," and the "weak cognitive-semantic hypothesis."

The first of these hypotheses, the non-linguistic strategy hypothesis , holds that the changes in response patterns evidenced in these studies are due to changes in children's strategies for responding to experimental stimuli. That is, there is a change with age either in the child's preference for choosing one type of object over another, regardless of instruction, or in his adeptness at guessing from the context what it is the experimenter wants him to respond. An older child may show a strong tendency, in any setting, to choose the taller of two objects. Or he may have learned that when a person effects some change on objects in the environment, it is probable that the effects of that change will be appropriate and significant in any subsequent question or discourse. His own responses to a subsequent question, then, should refer to that change.

The former strategy would lead children to respond to big as if it means "tall," and it would be consistent with other non-linguistic strategies that children have been shown to use in experimental settings. In studies of the acquisition of more and less, children have demonstrated a non-linguistic response bias for choosing the greater of two arrays, even when simply instructed to "choose one." (Trehub and Abramovitch 1978, Weiner 1974. See Gathercole 1979 for relevant discussion.) Similarly, the latter strategy could lead the children who had witnessed the movement of one object in Maratsos (1974) to guess

that the experimenter's next question would have something to do with the effects of that movement. Since the effect of movement was always a change from objects standing at the same level to objects standing at different levels, the child might readily respond to the experimenter's questions containing big and tall by focusing on the difference in levels and guessing that the appropriate response was the higher object. The higher object might simply be chosen because it respected the positive polarity of big and tall.

There are several strong arguments against the non-linguistic strategy hypothesis, however. First, the subjects appear to have responded with great confidence in these studies. With regard to the possibility that children were "distracted" by the movement in the movement conditions in his study, Maratsos (1974: 374, fn. 4) reports that some children in pilot work and after completion of the study were interviewed about their incorrect responses to big. The children always kept to their contention that a small but high object was the big one and sometimes became annoyed at the repeated questioning.[2]

Secondly, even if non-linguistic strategies might play some role in the children's responses, there are several aspects of the data that a non-linguistic strategy hypothesis cannot explain. In particular, if we hypothesized that a child's responses to big as if it means "tall" are an artifact of his non-linguistic preference for choosing the taller object of a pair, this does not explain children's responses to big in conditions in which stimuli were of equal heights, but different widths. In such a condition, since the objects were of equal heights, the hypothesized non-linguistic strategy of choosing the taller object would not be relevant, and the children should have been able to easily choose the correct object in responses to big questions. However, in these contexts, Maratsos (1973) found that the older children still responded incorrectly to big by asserting, e.g., that both objects were big. Similarly, if we hypothesized that children's responses to big and tall as if they mean "high" were a result of a strategy of choosing an object according to the effects of a witnessed change, we could not explain the fact that even in the static condition, the older children responded to tall as if it means "high."

In addition, there is independent evidence in the literature that the use of non-linguistic strategies in experimental settings is most useful for the child and most prominent at stages that occur before he can respond correctly to a form or construction. In their study of the acquisition of more and less, Trehub and Abramovitch (1978) found that the non-linguistic strategy of choosing the greater of two arrays was only significantly present in those subjects who made errors on less; for those subjects who responded correctly to less, this response bias was non-significant. In relation to children's understanding of complex sentences, Cromer (1976) and Bowerman (1979) point out that children use strategies to interpret complex sentences whose structure is not yet understood. Bowerman adds, "Once they can process these sentences, they

no longer need the strategies and begin instead to interpret them on the basis of structural knowledge" (1979: 304). According to the non-linguistic strategy hypothesis, the hypothesized sequence in children's responses to big and tall would be counter to this general trend. The child first would respond to a word correctly and only later would he rely heavily on non-linguistic strategies to respond. This reversed sequence suggests that more than a simple response bias must be responsible for the change in children's responses to big and tall.

Since the non-linguistic strategy hypothesis cannot account for all the data, and since it would be difficult to explain why the use of a response strategy would become prominent after the child can already respond appropriately to big and tall, we must search for alternative explanations for the decrements in children's responses to big and tall. Although one can postulate several different alternative hypotheses, there is one aspect of the adult-like uses of big, tall, and high that plays a role in all of these hypotheses. Common to all of them is the position that the changes in children's responses to big towards favoring extension along the vertical dimension and to tall and big towards favoring the higher object are to some extent due to the fact that bigness, tallness, and highness are often correlated with each other in the real world. Big can be and often is applied appropriately to extension along the vertical dimension; big and tall can be and often are applied appropriately to objects that have high top points. Maratsos (1973) points out that a "socially important usage" of big in adult speech to children occurs when measuring children's relative sizes by their heights. Similarly, Maratsos (1974) notes, "children often hear tall and big used of things with higher top points; in particular, they are used of adults as opposed to children" (1974: 372).

In the absence of such an enviornmental correlation or overlap, it is questionable whether the child would ever respond to big as if it means "tall" or to big and tall as if they mean "high." Note that the meanings of other words that are semantically related to big in much the same way as tall and high are do not seem to influence children's responses to big in the same way. For example, long, deep, and thick are all positive-pole relative spatial adjectives, like big, tall, and high. However, neither the horizontal dimension, to which long usually applies, nor the meaning "deep" or "thick" seems to have an overwhelming effect on children's responses to big in the same way as the vertical dimension, to which tall applies. Note also that the vertical dimension and highness do not similarly influence children's responses to other words that are not correlated environmentally with tall and high. E.g., older children do not respond to heavy by favoring the vertical dimension (Maratsos 1973). But the vertical dimension does influence children's early understanding of older and younger since age, like size, is environmentally correlated with height (Kuczaj and Lederberg 1977).

Although the overlapping environmental correlations of big, tall, and high are important in explaining older children's incorrect responses

to big and tall, they can be seen only as indirect or secondary causes for such responses. As Maratsos (1974) carefully points out, these environmental correlations between big, tall, and high are always present in the environment. If this were the only factor influencing children's uses of big and tall, highness and verticality should be as influential early in development as they are later in development. Beyond these environmental correlations, then, there must be some change in the child's knowledge that is ultimately responsible for changes in responses to big and tall.

One hypothesis, the weak semantic hypothesis, holds that the child has merely discovered that there is a semantic relationship between big and tall, and between big, tall, and high. That is, he has realized that these are all positive-pole, relative spatial adjectives, and because of this realization, coupled with the fact that these three adjectives are environmentally correlated, he begins to confuse them. There are two problems with this hypothesis, however. First, the discovery of a semantic relationship between words might lead to some errors in the child's uses of those words, but those errors would probably be sporadic ones, or at least less frequent than correct uses (Bowerman 1978a, 1978b states that the errors she discusses were infrequent relative to the number of correct uses.). One would predict that as a result of such a discovery the child's use of one word with the meaning corresponding to the other will not be consistent. It should be relatively easy for him to switch from an error of word choice to correct use. In cases such as that in which children incorrectly responded that a higher, smaller object was the big one (Maratsos 1974), if this incorrect response merely grew out of a realization that big and high are semantically related, the children, when pressed, should have readily revised their incorrect response to a correct one. Recall, however, that not a single child of those interviewed in Maratsos (1974) corrected his response.

In addition, under the weak semantic hypothesis, one should probably find responses that went in both directions -- e.g., not only should big be understood as "tall" and "high," but high and tall should be sometimes understood as "big." But the older children in Maratsos (1974) responded perfectly to questions containing high; they never treated it as if it meant "big."

And, finally, the weak semantic hypothesis might also predict that big will similarly be confused with, e.g., long, deep, and thick. Although these adjectives do not bear as strong an environmental correlation with big as tall and high do, long is of particular interest, since bigness does sometimes correlate with length (as in a "big car"), and long appears to be learned at about the same time as tall (Clark 1972, Bartlett 1976, Brewer and Stone 1975). But there is no indication that the horizontal dimension, to which long usually applies, ever takes on the importance that the vertical dimension does in children's responses to big.

A second alternative hypothesis, the weak cognitive-semantic hypothesis, holds that although the environmental correlations of big, tall, and high (or bigness, tallness, and highness) are always present, the child may not always be aware of those correlations. It is possible that as the child gains experience with each word and its application in the world, his knowledge of the overlapping applications of these words grows. The decrements in children's responses reflected in these studies could be due to such an increase in the child's knowledge of the overlapping applications of big, tall and high and confusion resulting from that increased awareness. Such a progression from correct to incorrect use because of increased awareness of similarities in application has been reported for children's production of bring, take, put, and give (Bowerman 1978a, 1978b). Bowerman's daughters initially used these verbs correctly. Later, however, because of an increased awareness of the semantic relationships among these words, they began to make errors in the choice of these verbs -- e.g., put was used for "take," "give," and "bring"; take was used for "bring" and "put"; give was used for "put"; and so forth.

It appears, however, that such a progression from correct to incorrect usage of a set of words on the basis of a growth in the child's awareness of relationships among those words might, of necessity, start from a point at which the uses of the words are independent and only later begin to intersect. In reference to the late-emerging errors in the child's choice of put, take, give and bring, Bowerman hypothesizes that the child is initially able to use the verbs correctly because he uses them in relatively specific, and different, contexts:

> the semantic ranges across which the words are initially applied are not nearly so broad nor so closely related as in adult speech...(1978b: 390-391).

The later errors appear to arise when "the words begin to bump up against each others' territories and to compete for selection in particular speech contexts" (1978b:391). However, the children's initially correct uses of big and tall, unlike the initially correct uses of the verbs studied by Bowerman, do intersect. It is clear that the early knowledge of big and tall evidenced by 3-year-olds in Maratsos (1973,1974) includes uses of big and tall in contexts in which these words do overlap environmentally. That is, their correct responses to big and tall indicate that, when it is appropriate, they can use both adjectives in reference to greater extension along the vertical dimension. When the clearly correct uses of two words already include uses in overlapping contexts, it is difficult to predict whether a simple growth in the child's familiarity with the uses of the two words would lead to confusion or increased accuracy in the child's uses of the words.

Of course, it is difficult to determine if the 3-year-old child is aware of the similarity of his overlapping uses of big and tall. Perhaps increased awareness of this overlap could result in confusion. Even then,

however, it is not clear whether a confusion that arose from an increased awareness of overlapping uses would affect children's comprehension in contexts where the applications of the words do not overlap. Suppose, for example, big and tall became confused by a child because he realized that both could be applied to greater extension along the vertical dimension. In contexts in which two stimuli of equal heights, but different widths, were present, would the child find it easy to respond appropriately to "Which one is big?" or would the confusion caused by awareness of the overlapping applications of big and tall overflow into this non-overlapping context?

To answer this question, we might draw on Kuczaj and Lederberg's (1977) work on the acquisition of younger and older. Kuczaj and Lederberg hypothesize that a child's first guess about the meaning of older and younger is based on the environmental relationship between age and height, so he equates older with "taller" and younger with "shorter." Later, the child learns that chronological age is important to the meanings of these terms, but he is still influenced by relative size. At this stage, he is able to correctly respond to older and younger on the basis of age when he is presented with two dolls of the same height, but when the stimuli are of unequal heights, he will still treat the taller one as the older one and the shorter one as the younger one. Kuczaj and Lederberg remark:

> This finding suggests that when children learn something additional about the meaning of a word, this additional component will not necessarily replace or override previously learned aspects of the word's meaning...(1977: 413).

Thus, the child will use that component in some restricted contexts, but he will rely on previously accumulated information to use the word in other contexts.

Although Kuczaj and Lederberg were dealing with the acquisition of knowledge that allows the child to correct a misapplication of words, and here we are concerned with the child's acquiring knowledge that leads him to use a word incorrectly, we can speculate that the child's new awareness of the overlapping uses of big and tall might similarly affect his use of big in only some contexts. A confusion caused by an increased awareness of the intersecting applications of big and tall would probably lead to inconsistency in response patterns, whereby the child would have difficulties in the overlapping contexts, but would still be able to respond correctly in the non-intersecting contexts.

Although it is difficult to conclusively rule out the weak cognitive-semantic hypothesis, there are two other hypotheses that can more adequately explain the decrements in children's understandings of big and tall. These two hypotheses, which I shall refer to as the "strong cognitive hypothesis" and the "strong semantic hypothesis," are both

based on hypothesized new insights, or a reorganization, in the child's knowledge of the world or of the semantic makeup of words.

The Strong Cognitive Hypothesis The strong cognitive hypothesis theorizes that the decrements in children's responses to big and tall are a result of hypothesized changes in the child's categorization of the world. Although Maratsos' explanation for these decrements seems to vacillate between causes rooted in semantic development and causes rooted in the child's cognitive development, he appears to favor a strong cognitive explanation. He asserts that the "most parsimonious explanation" for the changes in children's understandings of big and tall is that as children grow older, the vertical dimension and top point acquire greater salience as perceptual categorizations. As the vertical dimension and top point gain perceptual salience for the child, they affect the child's use of the words that are environmentally correlated with these spatial categories.

The cognitive changes could affect the child's use of a given word in one of at least two ways. First, the salience of a spatial category may allow the child to notice the fact that a given word is used in reference to that spatial category. Because of this he might add a reference to that spatial category to his definition of the word. This is essentially the stance taken by Maratsos. With respect to his finding that big is understood by older children as if it means "tall," Maratsos states:

> there is indeed an age progression from a more general definition of "big" toward a definition which employs extension along the vertical dimension as the critical defining characteristic of "big"...(1973: 748). [Underlining mine.]

In reference to the finding that big and tall are treated by older children as if they mean "high," Maratsos asserts:

> Because of a growing tendency to notice top point in situations including those of lexical usage, the child would increasingly notice the respective correlations of top point with uses of the words high, tall, and big. Since greater top point is in fact correlated most strongly to uses of high (perfect correlation), next most strongly to uses of tall, and least strongly to uses of big, it would come to acquire influence on the definitions of those terms in just that order of degree -- greatest influence on high, next on tall, and least on big. (1974: 373)
> [Underlining mine.]

Alternatively, the young child's early definitions of big, tall and high may already include elements (either in systematic features, in unanalyzed form in haphazard examples, or in components of a prototypical concept) that refer to the vertical dimension and top point. The child's growth in attention to these spatial categories cognitively may simply cause him to focus on those elements, which are already present, in the semantic representation of these words and lead him to favor those components in his application of those words.

To explain why there should be a developmental increase in the perceptual salience of certain spatial categories, Maratsos makes reference to the relative cognitive complexity of these categories and the theory that a more complex category should be learned after a less complex one. With reference to the increase with age in the salience of top point as a conceptual category, Maratsos (1974) states that top point is

> a more complex perceptual category than bigness and tallness. Top point consists of a relation (distance) between the highest point of the vertical axis of an object and the common baseline for all objects, the ground. Tallness and bigness, in contrast, can be defined by extensional properties of the object itself: bigness by general spatial extension and tallness be extension along the object's normal vertical axis. So top point refers criterially to extensional relations between part of the object and its general frame of reference in a way that tallness and bigness do not, which may make it perceptually more complex. (1974: 373)

A succinct summary of this strong cognitive view of the causes of the developmental changes in children's responses to big and tall can be found in Maratsos (1974):

> It seems likely that the semantic developments uncovered in these studies can best find their explanation in the interaction of word usage around the child with underlying changes in his perceptual categorizations of the environment. (1974: 373) [Underlining mine.]

The Strong Semantic Hypothesis The cognitive explanation outined above can be contrasted with an explanation that is based on hypothesized semantic changes in the child's lexicon. The manner in which semantic changes might affect a child's use of big and tall is hinted at in Maratsos (1973). Maratsos suggests that the increasing tendency to understand big as if it applies to a single dimension is consistent with improvement with age on more specific adjectives like tall and

wide, which are specified in terms of a fixed single dimension. He says,

> In the case of "big" the procedure of semantic analysis in terms of a fixed single dimension is apparently actively overextended, producing an incorrect definition (1973: 751).

Although Maratsos does not expand on this idea, the possibility that the child's increasing knowledge of other spatial adjectives might affect his use of big (and tall) is a very real one. In this section, I will develop this idea further and indicate how the decrements in children's use of big and tall might arise as a result of semantic developments in relative adjectives.

Recently, Carey (1978b) has proposed a new model for the acquisition of word meanings that distinguishes between knowledge of the appropriate application of a given word in particular contexts and more abstract knowledge of the systematic semantic content of a word. She hypothesizes that in acquiring the meanings of words, children initially accumulate and store "haphazard examples" of privileges of occurrence that arise from their experience with that word. From these haphazard examples, the child abstracts out features of meaning common to those examples. The features act as "lexical organizers," or semantic features that become available for use as components of meaning in that and other words in the language. For example, Carey suggests that at an immature stage of development, one child's lexical entry for tall might contain the haphazard examples shown in (1) and the systematic semantic information shown in the lexical organizers in (2).

1. [___building, ground up; ___person, head to toe]

2. [Adj.] [comparative] [+pole] (Carey 1978b: 286)

There are three aspects of this model that are relevant to our discussion here. First, at immature stages of development, although the child is not able to apply a given word appropriately in all contexts, he is able to use it appropriately in some contexts. (Keil and Carroll (1980) have presented data on the acquisition of tall that are consistent with such an immature stage of development.) Secondly, systematic, semantic features are abstracted out by the child after he has learned to use the word appropriately in some contexts. And, thirdly, the features the child has posited for one word are available for use in the definitions of other words.

The data on the decrements in children's understandings of big and tall can be seen as highly consistent with this model. The 3-year-olds are in general able to respond appropriately to big and tall, which would be predicted by Carey's model if the experimental stimuli are similar to the stored haphazard examples the children have accumulated for these adjectives. The subsequent decrements in children's

responses to big and tall might well arise from the child's discovery of the semantic features [+Vertical] and [+Positional] (or [+Top Point]). One feature common to all examples he has stored for tall will be reference to the vertical dimension, and one feature common to all exemplars for high will be reference to the position of an object relative to a ground level. The discovery of these features for tall and high, respectively, may lead the child to overextend these "lexical organizers" to environmentally related words, thus leading to the incorrect responses to big and tall reflected in Maratsos (1973, 1974) and Lumsden and Poteat (1968).

This strong semantic hypothesis offers a plausible explanation for the decrements in children's responses to big and tall that is markedly distinct from the strong cognitive hypothesis outlined above. According to this semantic explanation, the change that is ultimately responsible for changes in children's response patterns occurs in the child's knowledge of the semantics of words related to the word in question, not in his knowledge of and processing of the outside world.

Choosing Between Hypotheses

From the data in Maratsos (1973, 1974) and Lumsden and Poteat (1968), it is impossible to determine whether it is the strong cognitive hypothesis or the strong semantic hypothesis that more adequately captures the process that actually occurs in the acquisition of big, tall, and high. However, there is at least one kind of data that could prove instrumental in choosing between the two hypotheses: data on the acquisition of spatial adjectives in other languages.

The strong cognitive hypothesis bases the changes in children's understanding of big and tall on changes in the child's cognitive processing of the world. Apart from the fact that the cognitive categories to which the child attends will affect only those adjectives that are environmentally correlated with that category, the strong cognitive hypothesis claims that the changes in children's responses to big and tall are not at all related to the child's knowledge of the semantic makeup of those words. The strong semantic hypothesis, on the other hand, claims that changes in children's responses to big and tall are directly based on the child's knowledge of the meanings of words and his discovery of the features that are common to the haphazard examples he has stored for words. Given that many languages have spatial adjectives whose systematic semantic contents are not directly parallel to those of the spatial adjectives in English, the two hypotheses will make markedly different predictions about whether children learning one of those languages will demonstrate the same decrements in their understandings of spatial adjectives, particularly of the word for "big" in their language, as the English-speaking children do.

In the English language, both the vertical dimension and reference to position off the ground enjoy the status of systematic semantic

components that serve to define and contrast spatial adjectives. The adjective tall can be specified with the semantic feature [+Vertical] because it always refers to extension along the vertical dimension. It always refers to extension along the vertical dimension because there is a contrasting adjective, long, that is used in reference to extension along the non-vertical, or horizontal, dimension. Similarly, the adjective high can be specified with the semantic feature [+Positional] (or, perhaps [+Top Point])because it always refers to the position of an object off the ground. It always refers to position off the ground because there is a contrasting adjective, tall, that is used in reference to the extension of an object off the ground.

In a language in which there is only a single adjective corresponding to both English tall and long, such as in Arabic, ~~t~~awil, or in Turkish, uzun, the vertical dimension does not enjoy the semantic status that it has in English. These adjectives refer not only to extension along the vertical dimension, but also to extension along the horizontal dimension. Likewise, in a language in which there is only a single adjective corresponding to both English tall and high, such as in Spanish, alto, position off the ground is not an important semantic component, since there is no contrast between the extension and the position of an object off the ground. The adjective can refer to either.

According to Carey's model for the acquisition of word meaning, children learning Arabic and Turkish will not posit a feature [+Vertical], and children learning Spanish will not posit a feature [+Positional] for spatial adjectives. The strong semantic hypothesis outlined above, then, predicts that children learning Arabic or Turkish will not pass through a stage in which kabir and büyük ("big" in Arabic and Turkish, respectively) appear to mean "tall," and children learning Spanish will not pass through a stage during which grande ("big" in Spanish) appears to mean "high."[3] The strong cognitive hypothesis, in contrast, will predict that children learning these languages will pass through exactly the same stages as the English-speaking children do.

Implications of Cross-Linguistic Evidence

Such cross-linguistic evidence on whether children learning languages such as Arabic, Turkish, and Spanish show response patterns to the words for "big" in their languages comparable to those shown by English-speaking children would have important implications for the acquisition of word meaning. If the evidence came down in favor of the strong semantic hypothesis -- i.e., if children learning these languages do not demonstrate response decrements similar to those demonstrated by English-speaking children -- such data would lend very strong support to Carey's theory of the acquisition of word meaning. In particular, it would corroborate her theory that children abstract out semantic components for a word at a stage subsequent to a period during which the meaning of that word is contained in unanalyzed haphazard examples.

In addition, if the evidence comes down in favor of the strong semantic hypothesis, we can make important inferences about the process of feature acquisition on the basis of the data from English-speaking children. In the acquisition of systematic features, one might hypothesize that features are discovered and abstracted out by the child on the basis of contrasts. For example, one might hypothesize that the feature [+Pole] becomes a feature for the child at the point at which he understands that words such as big and little, and tall and short, form contrasting pairs, one member marked [+Pole] , the other [-Pole] . Alternatively, features might be originally postulated by the child on the basis of the meaning of a single word, rather than on the basis of what that word contrasts with. That is, the child might posit [+Pole] for big on the basis of its individual application, and independent of his abstraction of [-Pole] for little.

If the strong semantic hypothesis proved to be the correct hypothesis, the data on the acquisition of English tall and high would indicate that the second of these possibilities more aptly describes the process of feature acquisition. Recall that the feature [+Positional] is a component of high because high contrasts with tall, which is [-Positional] (or [+Extensional]). If [+Positional] were discovered for high by the child on the basis of the contrast between high and tall, the child would at the time of his discovery realize also that tall is semantically [-Positional] . The data on the acquisition of tall in Maratsos (1974) indicate that this is certainly not the case. According to the strong semantic hypothesis, the data in Maratsos (1974), in which children respond to big and tall as if they mean "high," are explained in terms of the child having discovered the feature [+Positional] for high and overextending this feature to the environmentally correlated words big and tall. Contrary to what one would expect if the feature [+Positional] was discovered for high because it contrasts with tall, this overextension occurs to a greater extent for tall than it does for big. The implication of this is that the child posits the feature [+Positional] for high entirely on the basis of the common aspects of the haphazard examples he has stored for high. Thus, if the strong semantic hypothesis proves to be valid, children, at least sometimes, posit semantic features for words as isolated elements, not in terms of their relationships to other words.

If the evidence favors the strong cognitive hypothesis -- i.e., if children learning languages like Arabic, Turkish, and Spanish do pass through the same decrements in their understandings of spatial adjectives in their languages -- the implications are just as important to consider. First, it should be made clear that this result would not necessarily contradict Carey's theory of the acquisition of word meanings. However, it appears to bring her hypothesized stage of the abstraction of features into question. If the child does posit systematic semantic features for words, one would expect this to affect his uses of those words in some overt way other than consistency of use. Consistency itself could arise merely from an accumulation of many more haphazard examples.

The most important thing to consider, however, if cross-linguistic data favored the strong cognitive hypothesis, is our criteria in determining what "counts" when describing a child's semantic representation of a form. We must ask if a cognitive change that affects a child's responses to a word automatically means that there is a concomitant semantic change in the child's representation of that word.

As discussed above, Maratsos' position in this regard appears to be that the hypothesized cognitive changes do effect semantic changes. Maratsos often refers to the "semantic developments" uncovered in his studies and changes in the definitions of the words. However, as also noted above, it is possible that there is no semantic change at all. It may be, instead, that the child's early definitions of big, tall, and high include references to the vertical dimension and highness, and the later cognitive developments simply cause the child to pay more attention to these elements in his applications of big, tall, and high.

Conclusion

In this paper, I have tried to untangle the various factors that might be responsible for the decrements found in the accuracy of children's responses to big and tall. I have treated each of the factors considered as if it is a separate, independent factor. It is possible, of course, that more than one of them affects children's responses to the adjectives big and tall, but it is important to determine, if possible, which is the most significant factor.

The most feasible hypotheses presented appear to be the strong cognitive hypothesis and the strong semantic hypothesis. Since the data presently available do not serve to choose between these two, I have indicated how cross-linguistic data on the acquisition of spatial adjectives might prove instrumental in choosing between the two hypotheses. In addition, the implications that such cross-linguistic data would have on our understanding of the acquisition of word meaning have been discussed.

Footnotes

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[1]One experiment that could be performed to determine whether higher top point, on the one hand, or higher base point or position on the other, is the important cue in children's "higher" responses would be one in which the subjects are presented with some pairs of stimuli for which the object placed at a higher base level has a lower top point than the object that stands at the lower base level.

[2]There are some indications, however, that in experimental settings in which response alternatives are available a child often responds confidently even to words he does not know. This is apparent in Wannemacher and Ryan's (1978) study of the acquisition of _less_, and in Carey's (1978a) study of the acquisition of _more_ and _less_ and the nonsense syllable _tiv_.

[3]One confounding variable, however, in Spanish is that although there is not a distinction between extension and position along the vertical dimension, there does appear to be one along the horizontal dimension. That is, Spanish _largo_ ("long") does contrast with _lejos_ ("far"). Ideally, to test the strong semantic hypothesis, one should find a language in which not only is there a single word corresponding to English _tall_ and _high_, but also a single word serves for both English _long_ and _far_.

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